

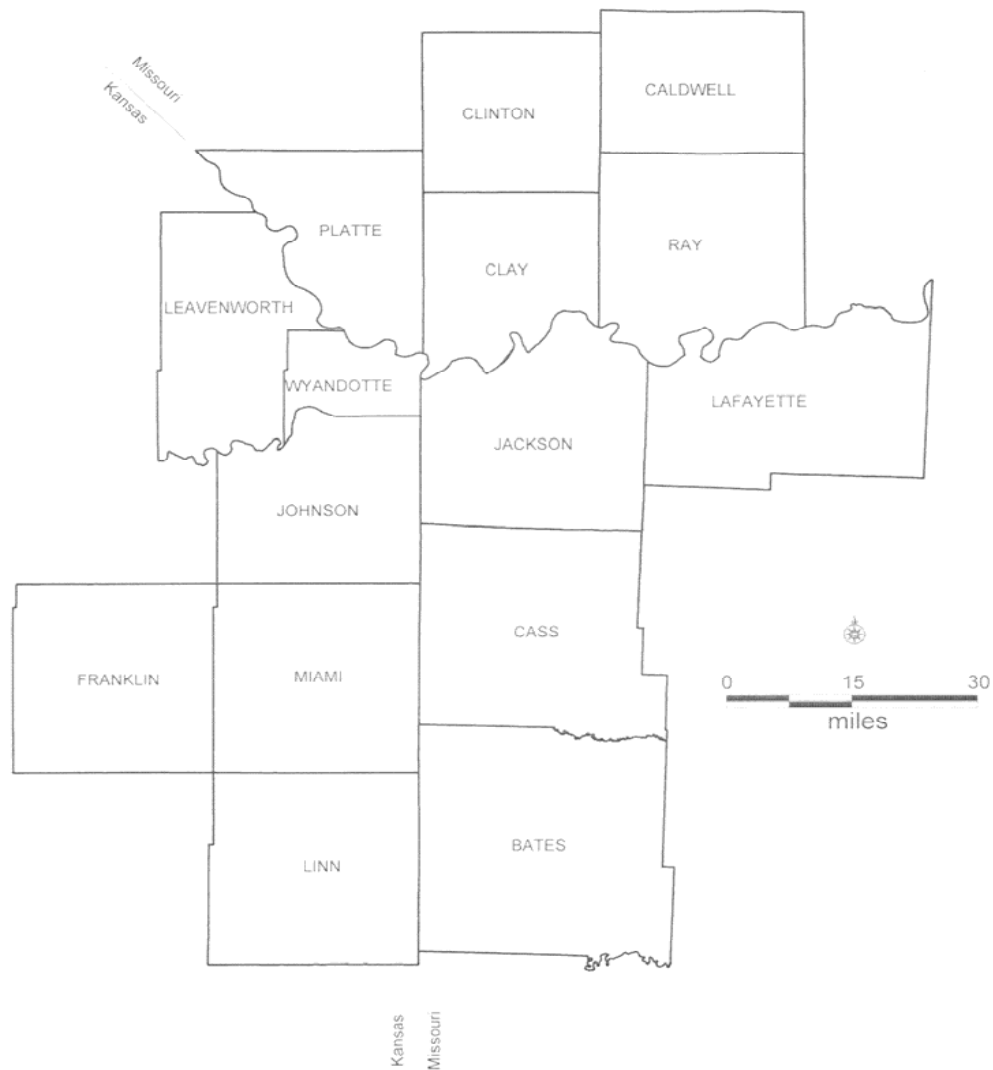
# Maintenance Plan Contingency Measures

- Primary focus on NO<sub>x</sub> reductions
- Phased approach
  - First trigger at 85 ppb
  - Large NO<sub>x</sub> sources in planning area first
  - Medium NO<sub>x</sub> sources in planning area and large NO<sub>x</sub> sources in Miami and Linn Counties next
- VOC reductions concurrent with phase 1 NO<sub>x</sub> reductions

# Kansas City NO<sub>x</sub> Point Sources

- Wall Fired Utility Boilers
- Cyclone Fired Utility Boilers
- Natural Gas Fired Furnaces
- Natural Gas Compressor Station Engines
- Cement Kilns

# Kansas City Metropolitan Statistical Area 2003



# Potential Implementation Triggers

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- Violation of standard – 85ppb design value
- Higher concentration – 90ppb
- Upward trend in design value

# Proposed Kansas Controls

- Phase I: Reduction in NO<sub>x</sub> emissions from point sources > 1000 tons of actual emissions per year in Wyandotte and Johnson Counties
- Phase II: Reductions in NO<sub>x</sub> emissions from point sources >100 tons of actual emissions per year in Wyandotte and Johnson Counties and large NO<sub>x</sub> sources in Miami and Linn Counties

# Proposed Kansas Controls

- Phase I – 1000 ton sources
  - Wall-fired EGUs in planning area
  - Furnaces??
- Phase II - 100 ton sources
  - Cyclone EGUs in planning area
  - Furnaces
  - EGU units and RICE units outside of planning area that contribute to KC ozone problem

# Phase I - Missouri Controls

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- Reduction in NO<sub>x</sub> emissions from point sources greater than 1000 tons of emissions per year of actual emissions in Clay, Platte, and Jackson Counties
- Will not include EGUs covered by CAIR

# Phase II - Missouri Controls

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- Reductions in NO<sub>x</sub> emissions from all point sources >100 tons of actual emissions in Clay, Platte and Jackson Counties
- This includes EGUs that were exempt from CAIR



# Coal Fired EGUs

- Wall-Fired
  - Proposed NO<sub>x</sub> emission rate of **0.23 lb/MMBtu**
- Cyclone
  - Proposed NO<sub>x</sub> emission rate of **0.15 lb/MMBtu**

Wall fired boiler EGU Control Measure Name	Control Efficiency (% from baseline)	Avg. Annual Cost Effectiveness (\$/kW primary pollutant)
Low NO <sub>x</sub> burner with Overfire Air	55%	\$23/kW - capital costs
Low NO <sub>x</sub> burner w/o Overfire Air	40%	\$17/kW - capital costs
SNCR	35%	\$10-\$20/kW - capital cost 0.5-1.5 mills/kWh - fixed O&M
SCR	90%	\$60-\$150/kW - capital costs 0.54\$/kW-yr(0.06 mills/kWh) - fixed O&M
Natural Gas Reburn	50%	\$30-\$60/kW (2000\$) - capital costs

<b>Cyclone boiler Control Measure Name</b>	<b>Control Efficiency (% from baseline)</b>	<b>Avg. Annual Cost Effectiveness (\$/kW primary pollutant)</b>
SNCR	35%	\$20-\$40/kW - capital cost 1.0-2.0 mills/kWh - fixed O&M
SCR	90%	\$100-\$250/kW - capital costs 1.54\$/kW-yr(0.09-2.5 mills/kWh) - fixed O&M
Natural Gas Reburn	50%	\$20-\$30/kW - capital cost 2.8 mills/kWh - O&M cost

# Non-EGU NOx Sources

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- ICI Boilers
- Furnaces
  - Flat Glass
  - Fiberglass
- Compressor Stations
  - RICE 2-cycle lean burn
- Cement kilns

# Industrial Boiler Control

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- Anticipated to mirror EGU controls
- May reevaluate based on cost per ton consideration

Boiler Control Measure Name	Control Efficiency (% from baseline)	Avg. Annual Cost Effectiveness (\$/kW primary pollutant)
Low NO <sub>x</sub> burner with Overfire Air	55%	\$23/kW - capital costs
Low NO <sub>x</sub> burner w/o Overfire Air	40%	\$17/kW - capital costs
SNCR	35%	\$10-\$20/kW - capital cost 0.5-1.5 mills/kWh - fixed O&M
SCR	90%	\$60-\$150/kW - capital costs 0.54\$/kW-yr(0.06 mills/kWh) - fixed O&M
Natural Gas Reburn	50%	\$30-\$60/kW (2000\$) - capital costs

Source: A Review of DOE/NETL's Advanced NO<sub>x</sub> Control Technology R&D Program for Coal-Fired Power Plants  
DOE/NETL NO<sub>x</sub> R&D Program Review, March 2005



# ICI Boiler – NOx Control Measure Summary (Limited List)

Measure Code	Source Type	Measure Name	NOx Control Curve		
			Individual Measure		
			Reduction	Cost	CPT
N01101	ICI Boilers - Coal/Wall	SNCR	5,814	\$11,131,293	\$1,915
N01104	ICI Boilers - Coal/Wall	SCR	13,082	\$31,223,648	\$2,387
N01201	ICI Boilers - Coal/FBC	SNCR - Urea	2,741	\$4,270,517	\$1,558
N01301	ICI Boilers - Coal/Stoker	SNCR	2,850	\$6,068,563	\$2,129
N01402	ICI Boilers - Coal/Cyclone	Coal Reburn	1,914	\$1,235,611	\$645
N01404	ICI Boilers - Coal/Cyclone	NGR	2,106	\$1,359,173	\$645
N01403	ICI Boilers - Coal/Cyclone	SCR	3,446	\$5,189,566	\$1,506
N01501	ICI Boilers - Residual Oil	LNB	5,537	\$4,981,574	\$900
N01502	ICI Boilers - Residual Oil	LNB + FGR	93	\$216,768	\$2,324
N01503	ICI Boilers - Residual Oil	SCR	8,933	\$20,871,182	\$2,337
N01601	ICI Boilers - Distillate Oil	LNB	438	\$1,113,018	\$2,539
N01602	ICI Boilers - Distillate Oil	LNB + FGR	202	\$474,182	\$2,345
N01603	ICI Boilers - Distillate Oil	SCR	2,235	\$10,762,085	\$4,816
N01701	ICI Boilers - Natural Gas	LNB	2,113	\$3,345,149	\$1,583
N01703	ICI Boilers - Natural Gas	OT + WI	39,000	\$48,404,268	\$1,241
N01704	ICI Boilers - Natural Gas	SCR	54,073	\$228,082,649	\$4,218

<b>Glass Furnace Control Measure Name</b>	<b>Control Efficiency (% from baseline)</b>	<b>Avg. Annual Cost Effectiveness (\$/ton primary pollutant)</b>
OXY-Firing	85%	2,100-4,400 (EPA,1994) 1,254-2,542 (IPCC,2001) 2,352 (DOE,2002)
SCR	75%	810-2,950 (EPA,1994) 727-1,941 (IPCC,2001) 3,000 (DOE,2002)
SNCR	40%	830-2,000 (EPA,1994) 840-1,617 (IPCC,2001) 1,382 (DOE,2002)
Low NO <sub>x</sub> burner	40%	790-1,920 (EPA, 1994) 323-1,045 (IPCC,2001)
Fuel Reburn	50%-65%	571-1,349 (for 3R, IPCC,2001)
Electric Boost	10%	2,600-9,900 (EPA, 1994)  7,100 (DOE,2002)



<b>RICE Control Measure Name</b>	<b>Control Efficiency (% from baseline)</b>	<b>Avg. Annual Cost Effectiveness (\$/ton primary pollutant)*</b>
L-E (low speed)	87%	500-2,000
Ignition Retard	20%	550-1,200
Air/Fuel + Ignition Retard	30%	500-1,900
Air/Fuel Ratio Adjustment	20%	380-2,000
SCR	80%	2,400-3,600

Source\* - Wide range of cost due to specific engine type and age.  
EPA AirControlNet Software and Documentation

# Cement Kiln Controls

- Plan on extending current State Regulation 6.380 to cover Clay, Platte and Jackson counties
- Control Options
  - Low NOx burner
  - Mid Kiln firing
  - 2.7 lb NOx/ton of clinker
  - Control technology that shows at least 30% reduction

Cement Kiln Control Measure Name	Control Efficiency (% from baseline)	Avg. Annual Cost Effectiveness (\$/ton primary pollutant)
Low NOx Burner	30%	\$ 5,750 - 6,125
Mid Kiln Firing	30%	\$ 3,600 - 3,900
Equivalent Process Changes	30%	Varies

# Tentative Time Frame for Implementation of Controls

- Violation of the standard 2007 ozone season
- EPA must determine violation occurred
  - Letter to states for implementation of controls
- States begin regulation implementation
  - Affected sources given time period to comply
- Sources must have controls in place end of time period

# Questions/Issues to be resolved

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- Actual vs. Potential Emissions
- Trigger for implementing supplemental control measures

**COMMENTS/QUESTIONS?**